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Forecasting Cool Season Daily Peak Winds at Kennedy Space Center and Cape Canaveral Air Force Station

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The expected peak wind speed for the day is an important element in the daily 24-Hour and Weekly Planning Forecasts issued by the 45th Weather Squadron (45 WS) for planning operations at Kennedy Space Center (KSC) and Cape Canaveral Air Force Station (CCAFS). The morning outlook for peak speeds also begins the warning decision process for gusts ≥ 35 kt, ≥ 50 kt, and ≥ 60 kt from the surface to 300 ft. The 45 WS forecasters have indicated that peak wind speeds are a challenging parameter to forecast during the cool season (October-April). The 45 WS requested that the Applied Meteorology Unit (AMU) develop a tool to help them forecast the speed and timing of the daily peak and average wind, from the surface to 300 ft on KSC/CCAFS during the cool season. The tool must only use data available by 1200 UTC to support the issue time of the Planning Forecasts.

Based on observations from the KSC/CCAFS wind tower network, surface observations from the Shuttle Landing Facility (SLF), and CCAFS upper-air soundings from the cool season months of October 2002 to February 2007, the AMU created multiple linear regression equations to predict the timing and speed of the daily peak wind speed, as well as the background average wind speed. Several possible predictors were evaluated, including persistence, the temperature inversion depth, strength, and wind speed at the top of the inversion, wind gust factor (ratio of peak wind speed to average wind speed), synoptic weather pattern, occurrence of precipitation at the SLF, and strongest wind in the lowest 3000 ft, 4000 ft, or 5000 ft. Six synoptic patterns were identified: 1) surface high near or over FL, 2) surface high north or east of FL, 3) surface high south or west of FL, 4) surface front approaching FL, 5) surface front across central FL, and 6) surface front across south FL. The following six predictors were selected: 1) inversion depth, 2) inversion strength, 3) wind gust factor, 4) synoptic weather pattern, 5) occurrence of precipitation at the SLF, and 6) strongest wind in the lowest 3000 ft.

The forecast tool was developed as a graphical user interface with Microsoft Excel to help the forecaster enter the variables, and run the appropriate regression equations. Based on the forecaster's input and regression equations, a forecast of the day's peak and average wind is generated and displayed. The application also outputs the probability that the peak wind speed will be ≥ 35 kt, 50 kt, and 60 kt.

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This abstract described work done by the Applied Meteorology (AMU) in predicting peak winds at Kennedy Space Center (KSC) and Cape Canaveral Air Force Station (CCAFS). The expected peak wind speed for the day is an important element in the daily 24-Hour and Weekly Planning Forecasts issued by the 45th Weather Squadron (45 WS) for planning operations. The 45 WS requested that the Applied Meteorology Unit (AMU) develop a tool to help them forecast the speed and timing of the daily peak and average wind, from the surface to 300 ft on KSC/ CCAFS during the cool season. The tool must only use data available by 1200 UTC to support the issue time of the Planning Forecasts. Based on observations from the KSC/CCAFS wind tower network, surface observations, and CCAFS upper-air soundings from the cool season months of October 2002 to February 2007, the AMU created multiple linear regression equations to predict the timing and speed of the daily peak wind speed, as well as the background average wind speed. Several possible predictors were evaluated, including persistence, the temperature inversion depth, strength, and wind speed at the top of the inversion, wind gust factor (ratio of peak wind speed to average wind speed), synoptic weather pattern, occurrence of precipitation at the SLF, and strongest wind in the lowest 3000 ft, 4000 ft, or 5000 ft.

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